



The CRUSHED STONE JOURNAL

In This Issue

■
The National Crushed Stone Association
Reaches Its Quarter-Century
Milestone
■

The Probable Materials Requirements of
the Crushed Stone Industry
During 1942

SILVER ANNIVERSARY CONVENTION

February 2, 3, 4, 1942

• Cincinnati, Ohio



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NATIONAL CRUSHED STONE ASSOCIATION



Technical Publications
of the
National Crushed Stone Association, Inc.



BULLETIN No. 1

The Bulking of Sand and Its Effect on Concrete

BULLETIN No. 2

Low Cost Improvement of Earth Roads with Crushed Stone

BULLETIN No. 3

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"Retreading" Our Highways

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with Discussion

BULLETIN No. 6

The Bituminous Macadam Pavement

BULLETIN No. 7

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The Crushed Stone Journal

Official Publication of the NATIONAL CRUSHED STONE ASSOCIATION

J. R. BOYD, Editor

NATIONAL CRUSHED STONE ASSOCIATION



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SOME OF THOSE WHO WILL SPEAK AT OUR SILVER ANNIVERSARY CONVENTION



HARRY W. FLANNERY
Berlin Correspondent,
Columbia Broadcasting
System,
Nov. 1940—Oct. 1941



FULTON OURSLER
Editor of Liberty
Magazine



DR. R. R. SAYERS
Director,
U. S. Bureau of Mines,
Washington, D. C.



HUGH WILSON
Special Adviser to the
Secretary of State, 1940,
Ambassador to Germany,
1938-39



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THE CRUSHED STONE JOURNAL

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NOVEMBER-DECEMBER, 1941

The National Crushed Stone Association Reaches Its Quarter-Century Milestone

THE Silver Anniversary Convention of the National Crushed Stone Association will take place on February 2, 3, and 4, 1942, at the Netherland Plaza Hotel, Cincinnati, Ohio. To all interested in the crushed stone industry, directly or indirectly, there is extended a most cordial and pressing invitation to be with us on this historic occasion and share in its many pleasures and benefits. It is our especial desire to have as many as possible of the "old-timers" participate in this event. Every possible effort is being made to get in touch with them and it is gratifying to be able to report that we already have definite assurance that a number of them will be on hand. It is realized that no matter how zealous our effort, we have been unable to locate some of those who were for many years engaged in the industry, but for one reason or another have not been attending our annual meetings during recent years, and in this regard may we ask each member of the industry to undertake, personally, to contact those in his area who should appropriately be invited to attend our Silver Anniversary Meeting.

In the following we shall endeavor to give a brief chronological preview of the highlights of the forthcoming meeting.

The convention will be opened at 10:00 A.M. on Monday morning, February 2, with J. A. Rigg, President, presiding. Immediately following his words of greeting he will give a summary of reports by Regional Vice-Presidents on business conditions during 1941 and the outlook for 1942. Reports will then be received from the Engineering Director and the Administrative Director. Dr. Wilbur A. Nelson, Administrator of Mine Priorities, Office of Production Management, will discuss today's all-important question,

"Quarrying Priorities." The morning session will conclude with the presentation of the National Crushed Stone Association Safety Awards by Dr. R. R. Sayers, Director of the U. S. Bureau of Mines.

The feature speaker for the Greeting Luncheon on Monday will be Harry W. Flannery, Berlin Correspondent for the Columbia Broadcasting System from November 1940 to October 1941. Mr. Flannery will give a "Berlin Report—Uncensored." It is no secret that our radio correspondents who were in axis-controlled capitals were limited in what they could say by severe censorship and it should therefore be of exceptional interest to hear Mr. Flannery give an uncensored report on conditions in Germany.

Monday afternoon two simultaneous group sessions will be held, one for superintendents and operating men and the other for salesmen. It seems certain that one of the major difficulties to be encountered by crushed stone producers during 1942 is the ability to obtain the necessary machinery and equipment to keep their plants running. Under such circumstances it is not only essential from an economic point of view, but equally desirable patriotically to give the most careful consideration to ways and means of conserving critical materials used in the production of crushed stone. This important round table discussion will be led by R. W. Cunningham, General Superintendent, Canada Crushed Stone Ltd., Hamilton, Ontario; M. A. Altgelt, Servtex Materials Co., New Braunfels, Texas; and Nelson Severinghaus, Consolidated Quarries Corporation, Decatur, Ga. Each of these men has given this problem real study and their observations should prove of the greatest value.

Critical shortage of metals can be greatly relieved through intelligent salvaging efforts. How this can

most effectively be done by crushed stone operators will be discussed by R. Merrill Decker, Deputy Chief of the Industrial Salvage Section of the Bureau of Industrial Conservation, Office of Production Management. We need hardly emphasize that there is real economic benefit to crushed stone producers in salvaging what must be thousands of tons of scrap metal lying idle around crushed stone plants and with the need for such scrap metal so urgent it is up to us to do our utmost to return it to the production line. The operating men's session will be concluded with a discussion on "Diesel Power Plants." While the use of Diesel power plants in the crushed stone industry has gained in importance during recent years, possible power shortages in the future give even greater emphasis to this subject.

The sales session will be devoted to a round table discussion of a number of subjects of particular interest to salesmen. George E. Schaefer will lead the discussion on "The Value of a Standard Sales Contract." Paul R. Anderson will lead the discussion on the subject, "How to Increase the Sales of Crushed Stone During the Winter Months." A. W. McThenia will lead the discussion on the subject, "The Marketing of Prepared Stone Sand." Verne C. Morgan will lead the discussion on the question, "Should Salesmen be Required to Make Collections?" It is anticipated that we will obtain a discussion leader for the important subject, "Cash Discounts Versus Net Terms." Salesmen can attend this session with the assurance that it will be devoted to practical discussions on matters of the utmost importance to them, by men particularly well qualified.

At the Tuesday morning session we will have the pleasure of hearing John C. Gall, formerly counsel for the N. A. M. and well known to crushed stone producers for his informative discussions before our conventions in the past, bring us up-to-date with regard to rulings and interpretations under the Wage-Hour and Walsh-Healey Acts. During the past year many decisions have been rendered which more clearly define the coverage of these Federal statutes and Mr. Gall's observations should help clarify the application of these laws to the crushed stone industry.

Following Mr. Gall, the Nominating Committee will make its report after which the election of officers will take place. The morning session will be concluded with an address by Colonel Willard Chevalier entitled, "The Value of Organized Effort." We are particularly fortunate in having Colonel Chevalier with us for our Silver Anniversary Convention

and, judging from past experiences, can anticipate an exceptionally fine talk.

At the General Luncheon on Tuesday, sponsored by the Manufacturers' Division, we have obtained the internationally known correspondent, Marcel William Fodor, to address us on the subject, "Total War on American Business." Mr. Fodor until recently was European Correspondent for the Chicago Daily News Syndicate and his remarks, based as they will be on personal observation and experience, should prove a highlight of the meeting.

The Silver Anniversary Banquet, which will take place on the evening of February 3, will long remain in the minds of those able to be present. Its setting will be dramatic and its program inspirational. Following the ceremonial part of the banquet the feature address will be given by H. W. Prentis, Jr. on the subject, "Roots of American Liberty." Mr. Prentis, when serving as President of the National Association of Manufacturers, spoke on behalf of American industry from one end of the country to the other and established a reputation of being one of industry's most inspiring speakers. It is a distinct honor to have him at our banquet and it will be a rare privilege for those who have the pleasure of hearing him.

The program for Wednesday morning will open with simultaneous group meetings for agricultural limestone producers and bituminous concrete producers.

We know of no subject of more general interest to agricultural limestone producers than "Government Policies and Future Plans Concerning the Marketing of Agricultural Limestone Under the Grant-of-Aid Program." We are happy to announce that F. B. Northrup, Assistant Director, Division of Special Programs of the Agricultural Adjustment Administration, and G. W. Mills, Chief of the Program Operations Section of the Division of Special Programs of the Agricultural Adjustment Administration, will jointly advise us concerning such plans and policies. The meeting will then resolve itself into a round table discussion of the question, "Should the Fair Price Procedure be Substituted for the Present System of Competitive Bidding?" It will be recalled that during the last session of Congress an amendment was made to the Soil Conservation and Domestic Allotment Act, permitting under certain circumstances the substitution of the fair price procedure for the current low bid procedure. This is a matter of the utmost concern and warrants the presence of every agricultural limestone producer in the country.

It has been our growing conviction that the use of the assignment procedure in marketing agstone has not been utilized nearly as much as it should be and largely because many producers are not familiar with the procedure. P. E. Heim of the Carbon Limestone Company has very successfully used assignments. His experiences in this regard should prove most helpful.

Because of the growing use of bituminous concrete it seemed desirable to have a special group session for bituminous concrete producers in order that problems of peculiar interest to them might be informally discussed. A large tonnage of crushed stone finds its way into bituminous road construction, much of it being used in bituminous mixtures made in asphalt paving plants. It is important, therefore, that our industry be kept aware of the developments in asphalt paving practice. These developments may involve new and cheaper types of mixing equipment, new ideas as to ways of using stone, new ideas as to suitability of different grades of asphalt for different conditions and climates. These are very practical matters of particular significance to the bituminous plant operator and to the stone producer. Bernard E. Gray, Chief Engineer of the Asphalt Institute, has had an unusual opportunity to observe these developments in different sections of the country and he is an outstanding authority on bituminous paving practices. His discussion of the subject, "Developments in Asphalt Paving Construction of Interest to Crushed Stone Producers and Asphalt Paving Plant Operators," should be of great value.

Following the discussion by Mr. Gray, A. V. Bratt, Chief of the Materials Laboratory, Massachusetts Department of Public Works, will discuss "Stripping of Bitumen from Aggregates." Of recent years more and more attention has been paid to methods of increasing the durability of all types of pavements, including bituminous as well as non-bituminous types. It has become recognized that one of the enemies of high durability is moisture and this is so because of the influence of water on the continuing adhesion of bituminous binder to the aggregate. Hence, ways of preventing asphalt from stripping from the aggregate in the presence of water is an extremely important and timely subject. We are fortunate in having in Mr. Bratt, an expert well qualified to present this subject to us.

These two groups will adjourn at 11:25 following which the entire convention will come together in one session to hear Hugh Wilson, Special Adviser to the Secretary of State in 1940, and Ambassador to Germany in 1938-39, address us on the subject, "America's Role in the World Crisis."

The concluding session of the convention on Wednesday afternoon will open with an address by Fulton Oursler, Editor of Liberty Magazine, entitled, "The Enemy Within." There is no need to emphasize the importance of this subject now that our Nation is at war. Mr. Oursler is exceptionally well informed in this field and enjoys a wide and favorable reputation throughout the country.

Crushed stone producers are properly and seriously concerned with regard to the highway outlook of the next few years. Few men, if any, are better informed as to this than Charles M. Upham, Engineer-Director of the American Road Builders' Association, who will be our speaker on this subject. The Wednesday afternoon session will conclude with a discussion entitled, "Defense Against Claims for Damage from Blasting," which will be presented by Harold Williams, a member of the Boston Bar. Judging from inquiries received during the past year, it is of the utmost importance to a growing number of crushed stone producers. Mr. Williams has for many years been handling damage suits in this field and is especially well qualified to give us authoritative information on the proper procedure to follow.

Our Silver Anniversary Convention will be concluded on Wednesday evening with the Convention Cabaret. This event is appropriately devoted to having a thoroughly good time. An excellent program of entertainment will be provided following which the remainder of the evening will be devoted to dancing.

But once in its history is an organization privileged to celebrate its Silver Anniversary. This, in itself, should be sufficient reason for every crushed stone producer in the country to be present in Cincinnati on February 2, 3, and 4. In addition, however, we have the need, now more than ever before, to jointly consider problems of mutual interest. Accordingly, nothing but the most extenuating circumstances should prevent your attendance at our Silver Anniversary Convention.

The Probable Materials Requirements of the Crushed Stone Industry During 1942

By A. T. GOLDBECK

Engineering Director
National Crushed Stone Association
Washington, D. C.

WAR has thrown a sudden demand on almost all kinds of materials and it is not surprising to find either the possibility of shortage or actual shortage existing in certain supplies. Non-essential uses must give way to vital war uses. If, after the war machine is supplied, there remains an excess of any particular material, it will be allocated to industry in accordance with the importance of that industry to war needs.

On December 13, we were requested by Dr. Wilbur A. Nelson, Administrator of Mine Priorities, Office of Production Management, to obtain for him an estimate of the critical materials requirements of the crushed stone industry. We were given until January 1, 1942, to obtain the answer. That was slightly over two weeks to prepare and mail out inquiries, analyze them and prepare a report. Necessarily, therefore, the results of such a quick survey must be taken as approximate. There was no time to exercise extreme care, nor was time available to conduct additional correspondence to look into out-of-the-ordinary appearing figures. As much care as possible, however, was used to obtain an accurate analysis of the data supplied by members of the industry in answer to the questionnaires they received.

The inquiry of December 13, asked for an estimate of the volume of certain raw materials used by the industry for equipment, maintenance repairs and supplies. A printed list of critical materials containing some 800 items was supplied by the O. P. M. Obviously in the short time allotted, it was not possible to break the metal requirements of the industry into the innumerable items thought desirable. We simply had to rush along with our analysis, keeping in mind the time limit and with the principal objective of getting an answer that would be of practical use even though not as detailed as might be possible under a less hurried procedure. The industry was also asked to list all units, fabricated parts or assemblies needed in 1942, giving the kind, type, size and number of such units. It was stated that the

types and quantity of raw materials contained in these fabricated parts would be obtained in Dr. Nelson's office. This, of course, is a tremendous undertaking. Also, because of the greatly increased use of steel plate for war needs, a detailed analysis of the plate requirements of the industry was requested.

As a result of the returns from our inquiry of the industry dated December 13, and including, also, returns from a limited questionnaire to only eleven members of the industry, dated December 9, we were able to present a report to the O. P. M. on December 31, 1941, essentially as follows:

Analysis of Questionnaire Replies—Raw Materials and Replacement Parts

Essentially, the critical materials necessary for continuing production of crushed stone may be included under:

- (a) raw materials and supplies;
- (b) replacement parts for production machinery and
- (c) new machinery units needed for the anticipated production.

All of the replies were not capable of rapid analysis in terms of the desired weights of materials. Especially was this so of that portion of the replies dealing with replacement parts and new machinery, for many replies merely listed those parts without giving the weights of metals involved. Probably if time had been available, these weights might have been painstakingly determined, but in the very short time allotted, this determination was not feasible. Fortunately, however, a reasonable number of questionnaires listed both raw materials and replacement parts for production machinery in terms of weights of raw materials or component materials. This portion of the replies was valuable and was considered representative of the industry; the remainder because of lack of definiteness could not be used.

The metals or other materials in the "raw materials" class and those involved in "replacement parts" are grouped together in the present analysis and are inseparable in some of the individual replies.

TABLE 1
QUESTIONNAIRE RETURNS—TONS OF FERROUS METALS REQUIRED AS RAW MATERIALS AND
REPLACEMENT PARTS—EXCLUDING THOSE IN COMPLETE, NEW MACHINERY—FOR 1942

Co. No.	Stone Production Tonnage	Carbon Steel	Structural	Hot Rolled	Cold Rolled	Plate	Forgings	Alloy	Tungsten Steel	Manganese Steel	Nickel	Chromium	Chrome- Vanadium	Silicon- Manganese	Cast-Iron	Cast Steel	Cast Manganese Steel	Miscellaneous Castings	Galvanized Sheet	Tinplate
13	62,130	1.11	—	1.5	.25	—	—	1.55	.001	—	1.8	.05	—	.25	.85	1.60	—	—	—	
15	14,607	—	—	—	—	—	—	—	—	2.75	—	—	—	—	1.0	—	.75	—	—	
17	10,000	—	.25	—	—	—	—	1.1	—	.1	—	—	—	—	—	—	—	—	—	
18	70,870	3.00	.4	—	—	—	—	10.25	—	1.5	.45	—	—	.05	—	—	10.60	—	—	
19	37,647	1.00	—	—	—	—	—	4.0	—	1.0	—	—	—	—	—	—	—	—	—	
21	162,265	.13	—	.75	—	—	—	.3	—	6.15	.5	.25	—	—	—	—	—	—	—	
22	342,937	1.47	—	55.39	—	.75	—	2.0	1.6	8.5	.84	.01	—	—	.45	1.91	—	—	—	
24	2,878	.05	—	—	—	—	—	.05	—	.5	—	—	—	—	—	—	—	—	—	
25	670,000	20.25	39.2	40.85	4.0	—	—	16.25	—	2.0	8.75	—	—	—	11.0	31.0	15.0	—	—	
26	1,087,263	31.9	22.5	23.0	—	—	—	24.5	—	53.5	33.81	—	—	—	5.0	—	—	—	—	
27	562,090	175.6	—	—	1.2	77.0	13.5	25.3	—	88.3	28.6	.5	.08	—	18.8	4.7	—	12.5	—	
28	244,970	19.3	—	1.7	—	—	—	1.75	—	.75	1.00	—	—	—	—	.25	—	—	—	
29	24,179	2.0	—	—	1.0	2.0	—	4.23	—	.15	1.00	—	.5	—	4.5	—	3.0	—	—	
31	138,800	1.0	—	.5	—	—	.15	—	—	.5	.33	—	—	—	—	—	—	—	—	
32	20,000	.15	—	—	—	—	—	.05	—	.15	—	—	—	—	—	—	—	—	—	
33	132,400	—	—	—	—	—	—	1.50	—	2.0	—	—	—	—	.3	—	—	—	—	
34	296,000	9.47	3.11	6.84	1.91	—	.15	1.88	—	3.16	5.64	2.14	—	.11	2.37	2.27	—	4.37	—	
35	1,500,000	40.00	—	10.0	15.0	—	—	89.0	—	—	30.0	—	1.0	—	—	—	40.0	—	—	
36	109,800	5.25	—	6.5	—	15.0	—	.25	—	—	.5	—	.5	—	—	—	—	.5	—	
39	1,170,000	92.74	200.0	285.3	35.0	351.0	8.6	67.5	—	24.5	10.85	1.0	2.0	—	105.85	59.8	15.0	16.0	.25	
42	500,000	6.0	—	7.6	6.0	—	—	2.5	—	—	5.5	.1	—	—	3.0	—	—	—	—	
43	2,239,000	69.99	34.96	249.27	9.38	34.93*	40.0	—	—	—	—	—	—	—	78.13	43.9	73.76	50.0	—	
45	118,600	3.6	—	1.5	—	5.0	—	3.0	—	1.75	.4	—	—	—	5.0	—	10.0	—	—	
47	1,500,000	47.0	55.0	140.0	5.0	45.0	—	13.0	—	—	3.0	—	—	—	10.0	10.0	—	10.0	—	
50	310,600	21.0	5.0	129.5	2.0	—	—	20.0	—	3.0	—	—	5.0	—	21.0	—	—	2.0	—	
56	40,000	.75	—	6.0	—	2.87	—	.15	—	—	.5	.05	—	—	—	—	—	—	—	
Total																				
tons	11,367,036	552.76	360.42	966.20	80.74	533.55	64.90	287.61	1.6	200.11	134.62	4.1	9.08	.41	270.05	158.43	168.11	50.0	50.49	.25
																		Total 3,893.43		
																		Ferrous metals unclassified 99.51		
																		Total ferrous metals 3,992.94		
* = 10.71 alloy plate + 24.22 = 34.93																				

* = 10.71 alloy plate + 24.22 = 34.93

The kind of metal used in the replacement parts frequently was not mentioned in the replies and, consequently, it became necessary to devise some method of quickly determining what metal would most likely be used. Machine parts in the course of time have become quite well standardized as far as metal characteristics are concerned and where definite metals were not mentioned as components of the fabricated parts, the "most likely" metals were assumed as follows, using Mark's Mechanical Engineers' Handbook as a guide, together with our general knowledge as to the use of metals.

Table of Ferrous Metals and Uses

(Other Uses are listed in the questionnaire replies.)

Low to high carbon steel—nuts, bolts, rivets, fittings, drills, carwheels, small tools
Structural steel
Hot rolled—pipe, tubing, rails, bars
Cold rolled—shafting
Plate
Forged steel—chain
Alloy—welding rod, screen cloth, punched plate, toggles
Manganese—welding rod
Nickel—cable, axles
Chromium—ball and roller bearings

Chrome—vanadium—tools
Silicon—manganese—springs
Cast iron
Cast steel—brackets
Cast manganese steel
Cast, unclassified
Galvanized sheet
Tinplate

Limitations on Method for Classification of Metals

As before stated, the classification of metals used in fabricated replacement parts was not always given in the questionnaires. The best information immediately available was used for making the distribution of metals to the classifications shown. Perhaps this distribution is not entirely accurate but it gives a better picture of the requirements of the industry than if all ferrous metals had been merely classified as such. More time and more detailed information might reveal the necessity for a redistribution of the metals in the several classifications, but the present distribution in Table 4 is believed to be fairly representative. Although welding rod is not given a separate classification, it is grouped under manganese steel and is a highly important material in the crushed stone industry.

Discussion of Results

No extended discussion of the results and the methods used in arriving at them seems to be needed, for these will be evident in the following tables:

Table 1 shows the results of those questionnaires which were definite in giving weights of ferrous metals, as such, and also as contained in replacement parts. New machinery is not included in this table. Twenty-six companies, having an anticipated annual production of 11,367,036 tons of stone in 1942 are included. Small, large and intermediate size companies appear in the tabulation. The stone production involved, 11,367,036 tons, is not quite 6 per cent of the total production of the entire industry, including non-commercial as well as commercial production. This sample is not large, but it was our experience, based on the analyses of Wage and Hour Questionnaires during the N. R. A. period, that a 5 per cent tonnage return gave results differing not greatly from those later determined, using a much larger percentage return. We were forced to assume that our present replies are representative of the industry and this is probably a safe assumption for estimation purposes.

The question may arise as to the proper tonnage of stone to use in calculating the factor by which the metal tonnages should be multiplied to determine the tonnages of metals required by the entire industry. Since it is assumed that the questionnaires analyzed are representative of the industry, the total tonnage from all questionnaires in any given analysis is used even though certain metals do not appear on all questionnaires. Thus, in Table 1 the factor by which the tonnage of each metal should be multiplied to determine the tonnage for the industry is the estimated total production for 1942 of 195,000,000 divided by 11,367,036 = 17.2.

Table 2 is similar to Table 1 except that it deals with non-ferrous metals and other materials. The same questionnaires were used as in Table 1 and, consequently, the same expanding factor, 17.2, must be used for these materials as for those in Table 1 to determine the requirements of the entire industry.

Table 3 applies to those machine parts, composed almost entirely of ferrous metals but for which the metals could not be identified. Here, again, the same questionnaires were used as in Tables 1 and 2 and the same multiplying factor applies for estimating the requirements of the industry.

Table 4 gives the final estimate of metals for the entire industry for the predicted tonnage of 195,

000,000. It involves all metals and other materials with the exception of those required for complete units of new machinery. Note that 70,970 tons of metals of all kinds will be required in addition to the listed tonnages of other materials. A number of the questionnaires also listed certain other materials such as lubricants, dynamite, gasoline, which were not included in this analysis. It is of interest to note that the final total tonnage of metals is equivalent to 0.73 pounds of metal per ton of stone, excluding metals necessary for manufacturing new machinery.

New Machinery

A determination of the metal requirements for new machinery presents a difficult picture. Unfortunately, in general, nothing appears in the questionnaire replies indicating either weights or dollar values of the machines listed. Hence, without access to this information from machinery manufacturers, an estimate, based on the returns of the December 13 questionnaire is impracticable. The time allotted did not permit of obtaining this type of information elsewhere. However, very fortunately the telegraphic inquiry sent to 11 members of the industry on December 9 did ask for dollar value of their new machine requirements for 1941 and when corrections are made in the returns from this particular inquiry to eliminate replacement parts, the indications are that these 11 companies, having a production of 10,855,000 tons, spent \$420,170.69 for complete new machines. A copy of the report resulting from the December 9 inquiry has already been submitted and a summary page, properly revised so as to include new machinery, only, is presented herewith.

SUMMARY OF REPLIES TO QUESTION 2—INQUIRY OF DECEMBER 9, 1941, REPORT DATED DECEMBER 15, 1941, REPORTED BY 11 COMPANIES—TONNAGE EQUALS 10,855,000.

Question 2—Dollar value, size, kind, type of machines purchased in 1941:

Total value of machinery	\$436,949.08
Total value of replacement parts	16,778.39

Total value of new machinery units, \$420,170.69

A complete list of the machines involved is included with our report of December 15.* The above alteration in that report by the subtraction of \$16,778.39 for replacement parts was necessary to make the data apply to new machinery units only as required in the present analysis.

Machinery in the crushed stone industry extends from extremely heavy machines such as crushers, not exceedingly complicated, to lighter complicated machines such as Diesel engines. The dollar value per ton of metal varies for each machine, but it is believed that 400 to 500 dollars per ton of metal is not far from the average value of this type of machinery as a whole. Our own judgment, considering the extremely heavy nature of some of the crushed stone production machinery is inclined to the assignment of \$400 per ton of metal as the most probable cost. Using this figure, it is indicated that for a production of 10,855,000 tons of stone, the 11 companies spending \$420,170.69, purchased

$$\frac{\$420,170.69}{\$400} = 1050 \text{ tons of metal}$$

The requirements of the entire industry would then be:

$$\frac{195,000,000 \text{ tons of stone}}{10,855,000 \text{ tons of stone}} \times 1050 \text{ tons of metal} = 18,800 \text{ tons of metal}$$

The cost of machinery per ton of stone =

$$\frac{\$420,170.69}{10,855,000} = 3.87 \text{ cents}$$

Number of pounds of metal required for new machinery per ton of stone =

$$\frac{18,800 \times 2000}{195,000,000} = 0.193 \text{ lb.}$$

Total pounds of metal required per ton of stone produced is then as follows:

Raw metal and replacement parts	= 0.73 (Table 4)
New machinery	= 0.19
Total	0.92 lb.

Classification of Metals in New Machinery. Table 5*

The classification of the various metals used in new machinery is a time-consuming task and could not be readily accomplished by us in the allotted time. Furthermore, it is seen from the above analysis that new machinery units account for roughly only 20 per cent of the total metal requirements. However, if the OPM desires to make such an analysis this can be done with the aid of the attached list of new machinery given in Table 5* for 44 companies having a production of 25,592,711 tons. This table will be useful primarily as a means for classifying the various metals required but could also be used to estimate weight as a check on the figure of 0.19 lb. of metal per ton of stone. However, its main usefulness will be for metal classification purposes.

TABLE 4.
FINAL SUMMARY RESULTING FROM TABLES 1,
2 AND 3
TOTALS FOR CRUSHED STONE INDUSTRY HAVING 195,000,000
TONS PRODUCTION

FERROUS METALS		
Carbon steel.....	9,482.6	
Structural steel.....	6,183.0	
Hot rolled steel.....	16,575.2	
Cold rolled steel.....	1,385.1	
Plate.....	9,153.0	
Forgings, steel.....	1,113.4	
Alloy steel.....	4,933.9	
Tungsten steel.....	27.45	
Manganese steel.....	3,432.9	
Nickel steel.....	2,309.4	
Chromium steel.....	70.34	
Chrome-vanadium steel.....	155.8	
Silicon-manganese steel.....	7.03	
Cast iron.....	4,632.7	
Cast steel.....	2,717.9	
Cast manganese steel.....	2,883.9	
Castings, unclassified.....	857.8	
Galvanized sheet.....	866.2	
Tinplate.....	4.29	
Unclassified.....	1,707.1	
Total.....	68,499.01	
NON-FERROUS METALS		
Brass or bronze.....	564.2	
Copper.....	733.2	
Zinc.....	630.4	
Babbitt.....	490.3	
Aluminum.....	1.03	
Solder.....	8.23	
Tin.....	9.44	
Antimonial lead.....	34.31	
Total.....	2,471.11	70,970.12 tons
		total metals
		x 2,000
OTHER MATERIALS		
Mechanical rubber goods (including tubes and tires)	2,290.7	141,940,420 pounds
Asbestos.....	42.54	divided by
Manila.....	1,292.3	195,000,000 tons
Mica.....	1.72	production equals
Metal Carbides.....	1.37	0.73 pounds per ton
Lumber, B.M.F.....	327,000	of stone.
Storage batteries units.....	926	(This does not include metal in complete, new machines)

Steel Plate Requirements of the Crushed Stone Industry

In Table 6* are shown the steel plate requirements of the entire industry. This was obtained by summing up the requirements of the 34 companies having a production of 23,950,021 tons, giving a definite answer to the Exhibit C part of the inquiry. These returns were taken as representative of the entire industry and when the tonnages of plate were expanded by multiplying by $\frac{195,000,000}{23,950,031}$, the tonnages given in Table 6 resulted. The final results for the entire industry are shown in Table 6. It is of interest to note

*Omitted from this report.

NOTE: A supplemental report shows the need for 13,700,000 cu. ft. of oxygen and 4,640,000 cu. ft. of acetylene.

that in Table 6 a total of 9512.9 tons of plate is indicated, based on returns from 34 companies, whereas the indicated tonnage of plate from Table 1, involving 26 companies and 11,367,036 tons of production is 9153. (See Table 4.) This is a reasonable agreement.

Conclusion

This report represents as accurate an estimate of the metal requirements of the entire crushed stone industry as was possible in the extremely limited time available and with the kind of information resulting from the inquiry of December 13, 1941. The analysis was made by members of the engineering staff of the National Crushed Stone Association with the assistance and under the direction of the writer.

Federal-aid Funds Apportioned

ACTING for Federal Works Administrator Philip B. Fleming, Assistant Administrator Baird Snyder, III, recently apportioned to the states \$100,000,000 for improvement of the Federal-aid Highway System, \$17,500,000 for secondary roads, and \$20,000,000 for elimination of hazards at railroad grade crossings.

These funds are for the fiscal year beginning July 1, 1942. They were authorized by the Federal Highway Act of 1940 and are reduced by deductions authorized for administrative expenses. It is required by law that the apportionment be made on or before January 1, 1942.

In making the apportionment Mr. Snyder emphasized that it will be the policy of the Federal Works Agency to restrict the approval of projects to those essential to national defense as certified by the appropriate Federal defense agencies.

Improvement of sections of highway that have been found to be inadequate for the greatly increased volume of defense traffic, strengthening or replacement of weak bridges on main highways, and improvements desired by defense officials in connection with planned operations will make up the program.

All work will be done in cooperation with the State highway departments according to the usual Federal-aid procedure except that projects will be limited to those having a definite defense significance.

The apportionment is as follows:

State	Regular Federal Aid	Secondary or Feeder Roads	Elimination of Hazards at Railroad Grade Crossings
Alabama	\$2,083,755	\$364,657	\$405,128
Arizona	1,435,456	251,205	129,583
Arkansas	1,709,471	299,157	336,460
California	3,989,896	698,232	798,434
Colorado	1,793,222	313,814	255,449
Connecticut	620,283	108,549	164,002
Delaware	487,500	85,313	97,500
Florida	1,431,426	250,499	299,694
Georgia	2,517,196	440,509	495,487
Idaho	1,238,004	216,651	165,774
Illinois	3,947,786	690,863	1,012,936
Indiana	2,409,852	421,724	503,499
Iowa	2,494,254	436,494	538,416
Kansas	2,524,344	441,760	485,674
Kentucky	1,853,318	324,331	358,327
Louisiana	1,479,614	258,932	317,974
Maine	866,360	151,613	133,885
Maryland	832,207	145,636	197,436
Massachusetts	1,310,162	229,278	388,101
Michigan	3,028,945	530,065	651,739
Minnesota	2,702,831	472,995	526,346
Mississippi	1,780,492	311,586	314,073
Missouri	2,963,919	518,686	578,946
Montana	2,020,796	353,639	262,388
Nebraska	1,991,271	348,472	333,931
Nevada	1,275,386	223,193	97,500
New Hampshire	487,500	85,313	97,500
New Jersey	1,273,680	222,894	376,647
New Mexico	1,622,549	283,946	177,246
New York	4,821,071	843,688	1,330,156
North Carolina	2,387,356	417,787	514,993
North Dakota	1,499,001	262,325	299,447
Ohio	3,520,305	616,053	818,984
Oklahoma	2,272,612	397,707	442,035
Oregon	1,649,132	288,598	228,533
Pennsylvania	4,087,815	715,368	1,089,534
Rhode Island	487,500	85,313	97,500
South Carolina	1,346,362	235,613	298,209
South Dakota	1,577,778	276,111	253,551
Tennessee	2,112,542	369,695	382,507
Texas	6,313,862	1,104,926	1,098,295
Utah	1,123,730	196,653	129,761
Vermont	487,500	85,313	97,500
Virginia	1,844,177	322,731	374,250
Washington	1,585,782	277,512	303,889
West Virginia	1,096,603	191,905	264,466
Wisconsin	2,400,972	420,170	483,930
Wyoming	1,245,987	218,048	131,879
District of Columbia	487,500	85,313	97,500
Hawaii	487,500	85,313	97,500
Puerto Rico	493,438	86,352	165,506
Total	\$97,500,000	\$17,062,500	\$19,500,000

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